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IS 11791 (1986): Diaphragm Type Valves for General Purposes [MED 17: Chemical Engineering Plants and Related Equipment]

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UDC 621·646·38

(First Reprint JANUARY 1998)

IS : 11791 - 1986
(Reaffirmed 2003)

Indian Standard

SPECIFICATION FOR
DIAPHRAGM TYPE VALVES FOR GENERAL PURPOSES

1. Scope — Specifies requirements for flanged and screwed end diaphragm valves for general purposes.

1.1 It covers valves with flanged ends of nominal diameters DN 10 to DN 300 and with internal screw threads of nominal sizes DN 6 to DN 80 according to IS : 9520-1980 'Specification for nominal sizes for valves'.

1.1.1 For each class and type, the range of sizes covered by this standard is shown in Table 1.

TABLE 1 FACE-TO-FACE, END-TO-END, CENTRE-TO-FACE AND CENTRE END DIMENSIONS FOR NOMINAL PRESSURE OF PN 1·0 AND PN 1·6

(*Clauses* 1.1.1, 8.1.4 and Fig. 1 to 3)

All dimensions in millimetres.

Nominal Diameter	Face-to-Face Dimension (Fig. 1)			Centre-to-Face Dimension (Fig. 2 and 3)					
	Unlined		Lined	Unlined			Lired		
	Short body	Long body							
DN	L	L	L_1	E	F	G	E_1	F_1	G_1
6	—	—	—	—	—	—	—	—	—
10	108	130	114	—	—	—	—	—	—
15	108	130	114	73	67	—	76	70	—
20	118	150	124	73	67	—	76	70	—
25	127	160	133	83	73	—	86	76	—
32	146	180	152	95	79	—	98	82	—
40	159	200	165	105	79	—	108	82	—
50	191	230	199	130	95	—	134	99	—
65	216	290	224	149	108	—	153	112	—
80	254	310	262	178	127	—	182	131	—
100	305	350	315	216	152	—	221	157	—
125	356	400	366	254	178	—	259	183	—
150	406	480	416	—	—	203	—	—	208
200	521	600	531	—	—	254	—	—	259
250	635	730	645	—	—	280	—	—	285
300	749	850	759	—	—	—	—	—	—

2. Definitions — For the purpose of this standard, the following definitions shall apply.

2.1 *Face-to-Face Dimension* — The distance between the two planes perpendicular to the valve axis located at the extremities of the body end ports of straight type flanged valves as in Fig. 1.

2.2 *Centre-to-Face Dimension* — The distance between the two planes located at the extremity of either body end port and perpendicular to its axis in the case of angle type flanged valves as in Fig. 2 and 3.

Industrial Valves Sectional Committee, EDC 81 ; [Ref : Doc : EDC 81 (3966)]

Adopted 14 August 1986

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Gr 5

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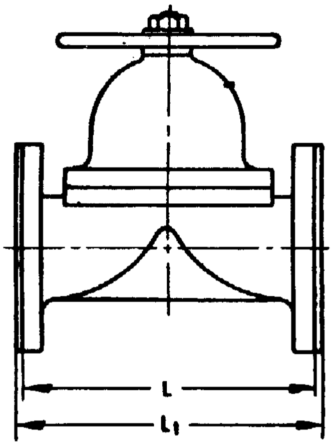


FIG. 1 FACE-TO-FACE DIMENSIONS

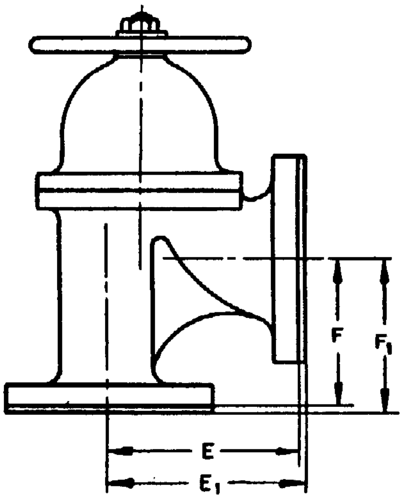


FIG. 2 CENTRE-TO-FACE DIMENSIONS (SIZES 15 mm TO 125 mm)

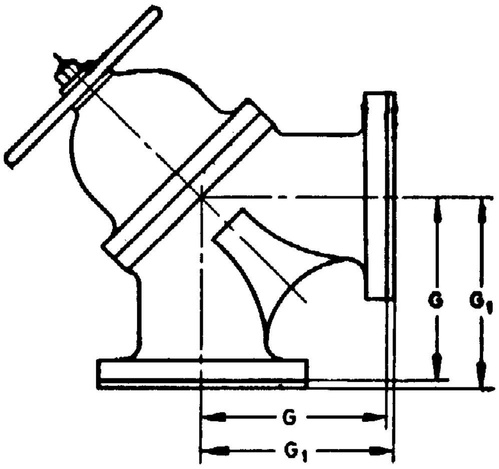


FIG. 3 CENTRE-TO-FACE DIMENSIONS (SIZES 150 mm, 200 mm AND 250 mm)

3. Types — Valves shall be of the following types having straight pattern or right pattern (where the axis of body end ports are at 90°) bodies with inside screw or outside screw rising or non-rising stems:

a) Weir type seating (Fig. 4),
b) Annular seating or seatings (Fig. 5),
c) Straight through passages (Fig. 6),
d) Venturi pattern straight through passage (screwed end) (Fig. 7), and
e) Venturi pattern straight through passage (flanged end) (Fig. 8).

Note — Figures 4 to 8 are illustrative only and do not imply required design.

3.1 The valve bodies may be either unlined or with elastomeric, plastic or glass lining depending upon the service requirements.

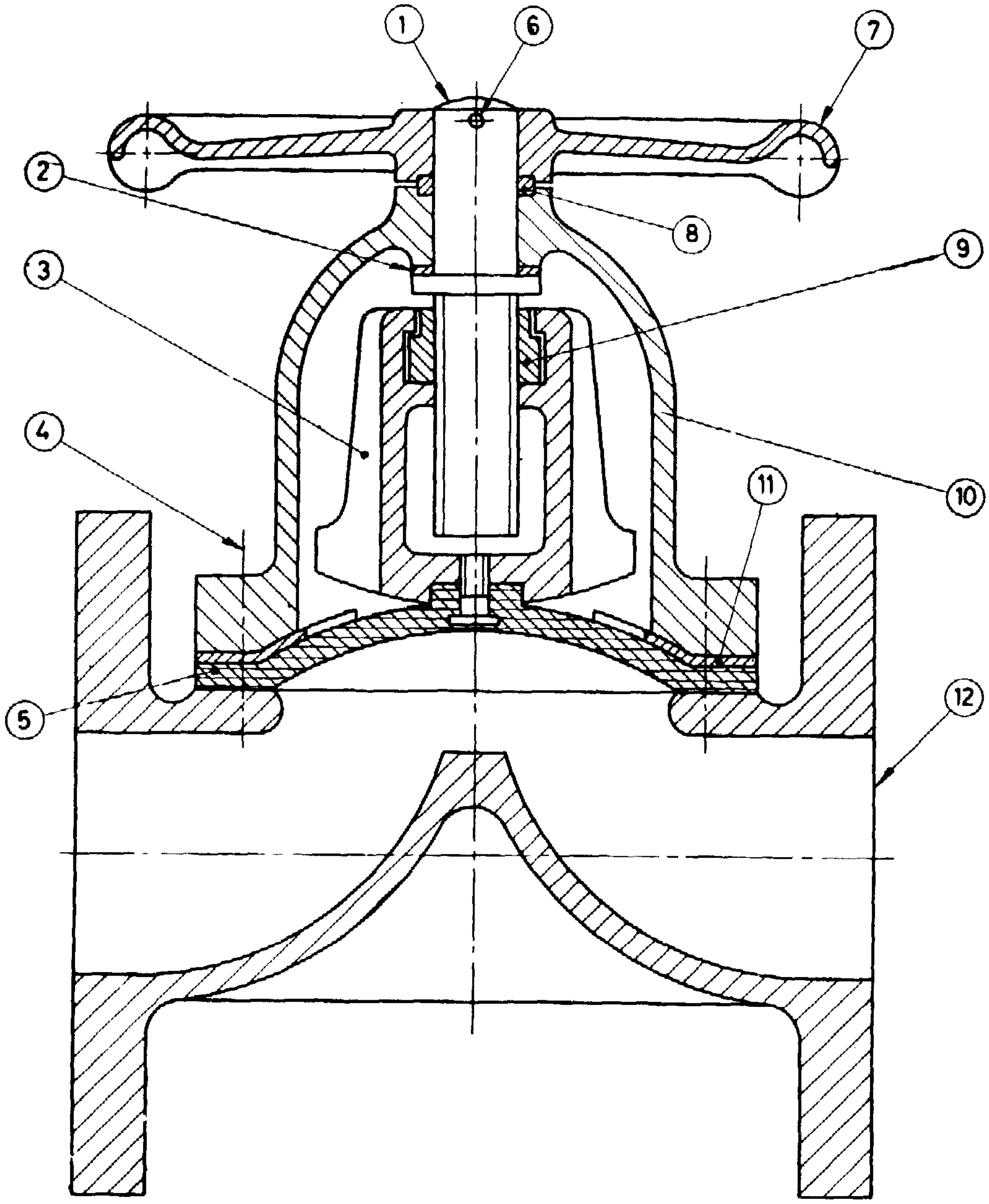
4. Nominal Diameters and Sizes — The nominal diameters (DN) of flanged end valves shall be as follows :

10, 15, 20, 25, 32, 40, 50, 65, 80, 100, 125, 150, 200, 250 and 300.

4.1 The nominal sizes of screwed end valves shall be as follows :

6(1/4), 10(3/8), 15(1/2), 20(3/4), 25(1), 32(1 1/4), 40(1 1/2), 50(2), 65(2 1/2) and 80(3).

The nominal sizes shown in parentheses refer to the size of screw threads according to IS : 554-1975 'Dimensions for pipe threads where pressure tight joints are required on the threads (*second revision*)'.



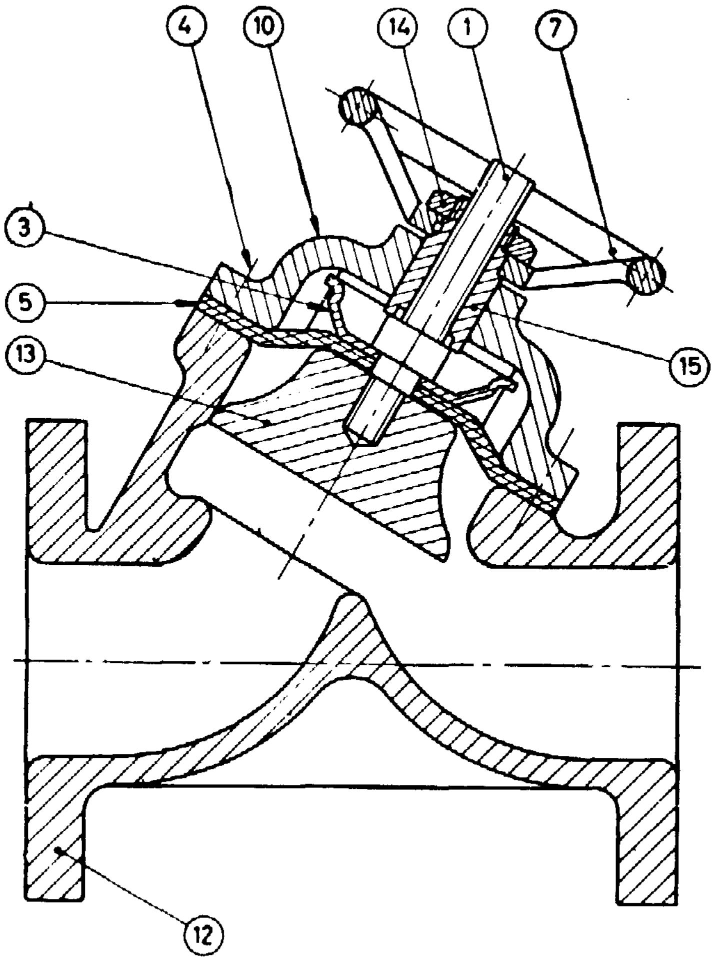
Part No.	*Name of Parts*	*Part No.*	*Name of Parts*
1	Stem	7	Hand Wheel
2	Washer (Taflon)	8	Washer
3	Compressor	9	Stem Nut
4	Studs and Nuts	10	Bonnet
5	Diaphragm	11	Finger Plate
6	Pin	12	Body

FIG. 4 WIER TYPE SEATING

5. Minimum Working Pressure — Valves shall be designed according to pressures given in Table 2.

6. Pressure/Temperature Ratings — The actual service pressure/temperature rating of the diaphragm valves shall be limited to the pressure/temperature rating of the body or the diaphragm, whichever is lower and shall be obtained from the manufacturer.

However, all valves shall be suitable for continuous use at their PN designation at temperature not exceeding 45°C.



Part No.	Name of Parts	Part No.	Name of Parts
1	Stem	10	Bonnet
3	Compressor	12	Body
4	Stud and Nut	13	Seat
5	Diaphragm	14	Nut for Sleeve
7	Hand wheel	15	Sleeve

FIG. 5 ANNULAR SEATING

7. Material — This standard is based on materials specified in Table 3 or other materials provided they are at least as suitable in all relevant respects. The use of other materials shall be subject to agreement between the manufacturer and the purchaser.

8. Design and Manufacture

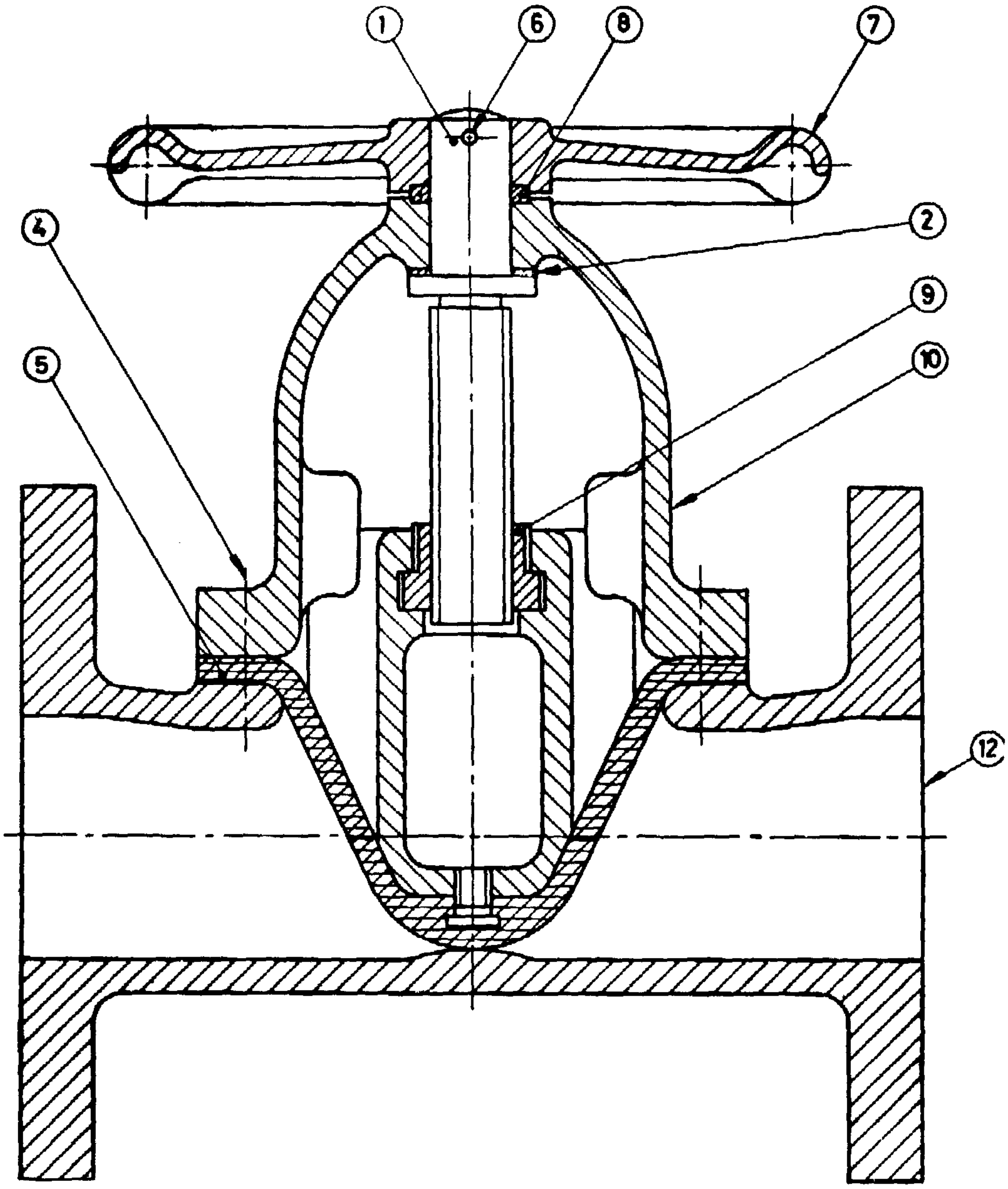
8.1 *Bodies*

8.1.1 The body end ports shall be circular. The bore dimensions at the body end ports of flanged valves shall be approximately equal to the nominal diameter.

8.1.2 The minimum body thickness at any point shall not be less than the values given in Table 2. Drilling or pinning for fixing name plates, etc, shall not reduce the body thickness below the minimum specified value.

8.1.3 The design of the valve bodies shall be such as will provide ample resistance to distortion under the maximum cold working pressure and under the specified pressure at the maximum temperature.

8.1.4 Face-to-face and centre-to-face dimension for flanged valves shall conform to the dimensions given in Table 1 and Fig. 1 to 3.



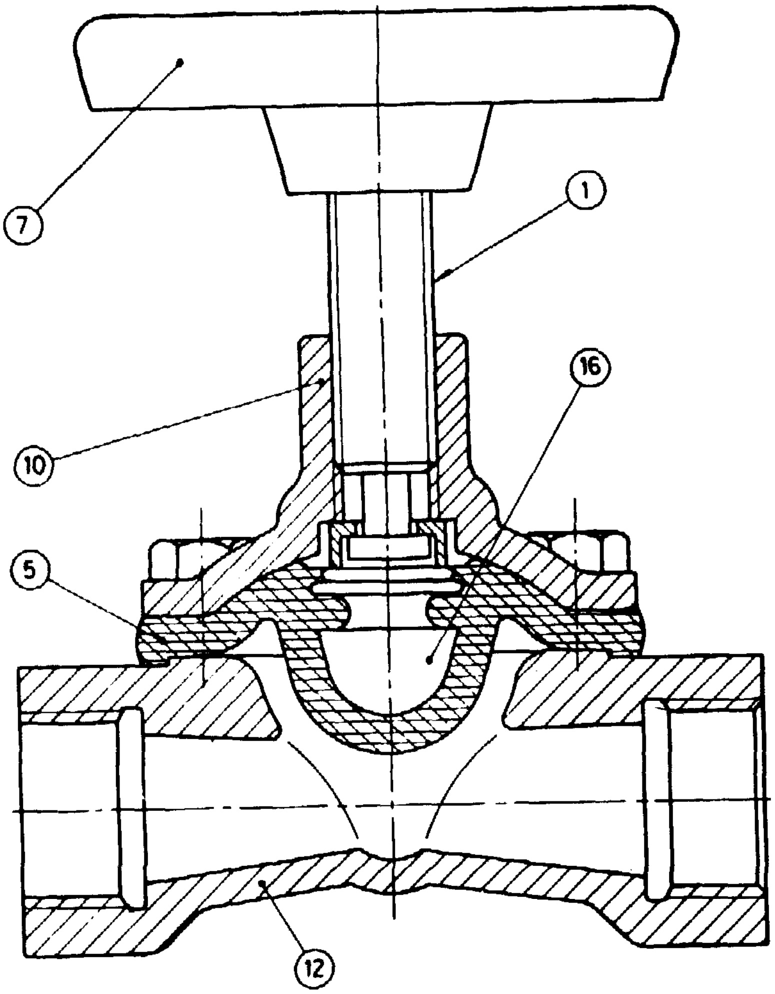
Part No.	*Name of Parts*	*Part No.*	*Name of Parts*
1	Stem	7	Hand Wheel
2	Washer (Teflon)	8	Washer
4	Stud and Washer	9	Stem Nut
5	Diaphragm	10	Bonnet
6	Pin	12	Body

FIG. 6 STRAIGHT THROUGH PASSAGE

8.1.5 The end flanges of flanged valves shall be integral with the body and their dimensions and drilling particulars shall be as in IS : 6418-1971 'Cast iron and malleable cast iron flanges for general engineering purposes', unless otherwise specified by the purchaser. These shall be spot-faced or back-faced and shall be machine finished on the joint side. When nothing particular is specified by the purchaser the flanges shall be supplied drilled and bolt holes shall be 'off centres'.

If any other flange dimensions are required by the purchaser, the same shall be specified in the purchase order and shall mutually be agreed by the supplier and the purchaser.

8.1.6 Screwed bodies shall have female parallel threads unless taper threads are specified by the purchaser. Threads shall be according to IS : 554-1975. Other forms of threads may be provided as specified by the purchaser. The minimum length of threads shall be as in Table 4.



Part No.	Name of Parts	Part No.	Name of Parts
1	Stem	10	Bonnet
5	Diaphragm	12	Body
7	Hand Wheel	16	Insert

FIG. 7 STRAIGHT THROUGH PASSAGE (SCREWED END) DIAPHRAGM VALVE (VENTURI PATTERN)

8.1.7 The end faces of threaded valves shall have a smooth finish at right angle to the axis. The minimum outside diameter shall be in accordance with Table 4.

8.2 *Bonnets* — The bonnets shall be capable of withstanding the closure forces, mechanical stresses of auxiliary equipment and pressure loading in the event of diaphragm failure.

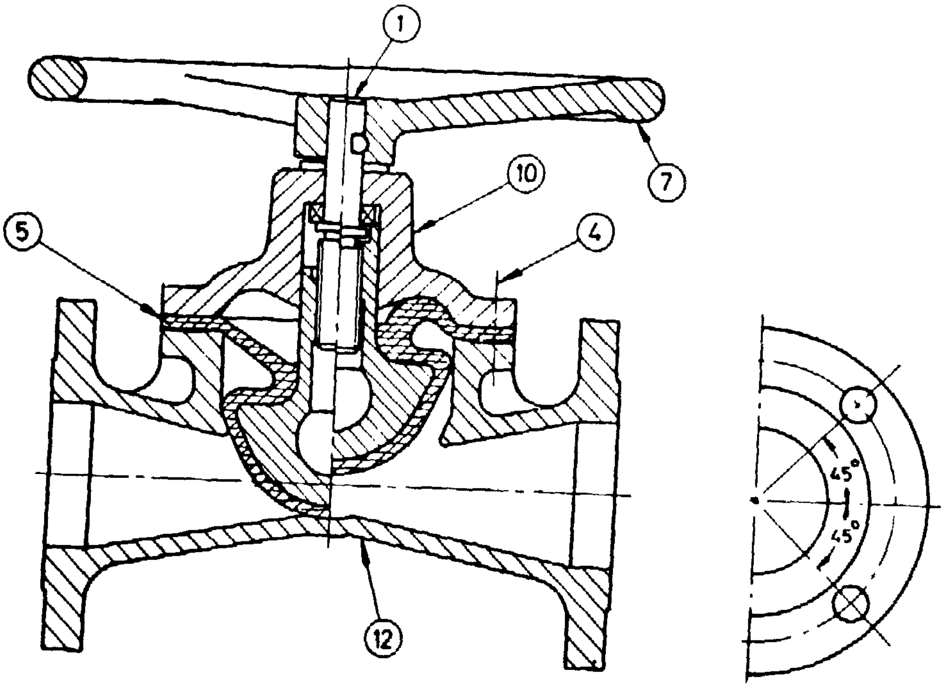
8.2.1 The bonnet material shall be cast iron, malleable iron, spheroidal graphite cast iron or cast steel at the manufacturer's option regardless of body materials, unless one of the bonnet material is specified by the purchaser.

8.2.2 The seal of the sealed bonnets specified by the purchaser shall be designed to contain line fluid or vacuum in the event of diaphragm failure.

8.3 *Body to Bonnet Joint* — The surface forming body to bonnet joint shall be machined smooth.

8.3.1 The body to bonnet joint shall be bolted bonnet type.

8.3.2 Bolts are studs less than M6 shall not be used and the bolting shall be of adequate size and strength to ensure bonnet tightness under pressure test.



Part No.	*Name of Parts*	*Part No.*	*Name of Parts*
1	Stem	7	Hand Wheel
4	Stud and Nut	10	Bonnet
5	Diaphragm	12	Body

FIG. 8 STRAIGHT THROUGH PASSAGE DIAPHRAGM VALVE, FLANGED ENDS (VENTURI PATTERN)

8.4 *Stems* — The stems shall be in one piece design, except in case of indicating or travel stop stem where extended pieces may be permitted.

8.4.1 The minimum stem diameters shall not be less than the values given in Table 2.

8.4.2 The threads on the stem shall be of square trapezoidal metric thread form conforming to IS : 4694-1968 'Basic dimensions for square threads', IS : 7008 'ISO metric trapezoidal threads' or IS : 4218 'ISO metric screw threads' respectively.

8.5 *Diaphragms* — The diaphragms shall be easily replaceable. Diaphragms shall be interchangeable between valves of same size, designation and type. The diaphragms shall be provided with adequate means of attachment to the actuating mechanism.

8.5.1 The manufacturer's grade reference for the particular material shall be marked on the diaphragm.

8.6 *Fasteners* — The screw threads of fasteners shall conform to IS : 4218.

8.7 *Hand-Wheels* — Hand wheel shall close the valve by turning in clockwise direction when facing the wheel. Hand-wheel shall be marked with the word 'OPEN' or 'CLOSE' with arrow to indicate direction of opening or closing. Alternatively these markings may be shown on a plate secured below the hand-wheel nut.

8.8 *Indicators* — When specified by the purchaser an indicator shall be provided to indicate the open and shut positions.

8.9 *Actuator Application Requirements* — The valve shall be designed to accept actuator of pneumatic, hydraulic and electric type depending on purchaser's requirements.

TABLE 2 WALL THICKNESS AND STEM DIAMETER

(*Clauses* 5, 8.1.2 *and* 8.4.1)

Nominal Valve Size	Minimum Shell Thickness (mm)				Minimum Nominal Stem Dia of Operating Threads (mm)
	PN 0·4, PN 0·6 and PN 1·0		PN 1·6		
	CI, SGI, MI, Al. Alloy, Bronze	CS and Alloy Steel	CI, SGI, MI, Al. Alloy, Bronze	CS and Alloy Steel	
6	3·0				10
10	3·0				10
15	3·5				10
20	4·0				10
25	4·0				10
32	4·0				10
40	4·5				10
50	5·0				14
65	5·0		6·0		14
80	5·0		6·0		18
100	5·5		6·5		20
125	6·5		7·5		22
150	7·0		8·0		26
200	8·0	7·5	10·0	8·5	30
250	8·5	8·0	12·0	9·0	32
300	10·0	8·5	14·0	10·0	32

9. Pressure Tests

9.1 *Shell Test (Hydrostatic)* — Each assembled diaphragm valve in the full open or partly open position shall be subjected to hydrostatic shell test to the test pressure of 1·5 times the maximum working pressure for the test duration of 2 minutes and there shall be no leakage when the pressure is applied to one end while other end is blanked. There shall be no air trapped within the valve when subjected to test pressure. These valves shall be tested before the application of paint or similar treatment, unless otherwise agreed between the purchaser and the manufacturer.

9.2 *Seat Test (Hydrostatic)* — The seat of the valve shall be hydrostatically tested to the maximum working pressures and the test duration of 2 minutes. Pressure shall be applied to each end successively the other being open to the atmosphere. No visible leakage is permitted during seat test.

10. Marking — Marking shall be as specified in IS : 9866-1981 'Marking systems for valves'.

10.1 *Standard Marking* — Details available with the Bureau of Indian Standards.

11. Test Certificates — When specified by the purchaser, the manufacturer shall issue a test certificate confirming that the valves have been tested in accordance with this standard and stating the actual pressures and medium used in the test.

12. Inspection — If inspection is required, this shall be stated in the enquiry and order. The purchaser or his authorized representative shall have access to the manufacturer's works at all reasonable times to inspect assembled valves according to his order.

TABLE 3 MATERIALS FOR COMPONENT PARTS OF DIAPHRAGM VALVES

(*Clause* 7)

Sl. No.	Component	Material	IS Specification
1.	Body, bonnet and compressor	i) Grey cast iron	Gr. FG 200 of IS : 210-1978
		ii) Malleable cast iron	Gr. B of IS : 2108-1977
		iii) Spheroidal graphite cast iron	Gr. SG 42/12 of IS : 1865-1975
		iv) Aluminium alloy	Designation A-6 of IS : 617 1975
		v) Carbon steel	Gr. 2 of IS : 2856-1979
		vi) Stainless steel	Gr. 10 of IS : 3444-1978 Gr. 1 of IS : 3444-1978 Gr. 4 of IS : 3444-1978
		vii) Leaded tin bronze	LTB2 of IS : 318-1981
2.	Stem	i) Extruded brass rod	Type II, half hard of IS : 319-1974
		ii) High tensile brass	HT 1 of IS : 320-1980
		iii) Forged brass	Designation Cu.Zn 42·Pb2 of IS : 3488-1980
		iv) Stainless steel	Designation 12Cr13 of IS : 6603-1972 Designation 04Cr18Ni10 of IS : 6603-1972 Designation 04Cr17Ni12 Mo2 of IS : 6603-1972
		v) Alloy steel	Gr 40Ni2Cr1 Mo28 of IS : 1570-1979
3.	Stem bush nut	i) Leaded tin bronze	LTB2 of IS : 318-1981 Designation Cu.Zn42Pb2 of IS : 3488-1980
		ii) Spheroidal graphite cast iron	Gr SG42/12 of IS : 1865-1974
4.	Bolting	i) Carbon steel	Minimum tensile strength 390 N/mm^2
		ii) Stainless steel	
		iii) Copper alloy	
5.	Diaphragm	i) Natural rubber	Manufacturer's standard
		ii) Butyl	
		iii) Neoprene	
		iv) Nitrile	
		v) PTFE	
		vi) Hypalon	
		vii) EPDM	
6.	Hand wheel	i) Grey cast iron	Gr. FG 200 of IS : 210-1978
		ii) Malleable cast iron	Gr. B of IS : 2108-1977
		iii) Carbon steel	Gr. 2 of IS : 2856-1979
		iv) Aluminium alloy	Gr. A6 of IS : 617-1975
		v) Plastic	

Note — Stem and stem bush nut materials are interchangeable as per agreement between manufacturer and purchaser.

TABLE 4 MINIMUM LENGTH OF THREADS

(*Clauses* 8.1.6 *and* 8.1.7)

All dimensions in millimetres.

Nominal size	6	10	15	20	25	32	40	50	65	80
Minimum length of thread	7·1	7·9	9·5	11·2	13·0	15·2	15·8	17·0	20·8	22·4
Minimum outside diameter of sealing face	18	22	26	32	39	49	55	68	86	99

13. Preparation for Despatch — The valves shall be complete in all respects when shipped. Each valve shall be drained, cleaned, prepared and suitably protected (painting of finished valves shall be at the option of the manufacturer unless specified by the purchaser) for despatch in such a way so as to minimise the possibility of damage and deterioration during transit and storage. The machined surfaces of ferrous valvas shall be coated with easily removable rust preventive. The austenitic steel and copper alloy valves may not be painted.

All valve diaphragm shall be as moulded position when despatched. The body ends shall be suitably sealed to prevent ingress of foreign matter during transit and storage.

14. The Information to be Supplied by the Purchaser Along with Enquiry or Order:

a) Type of valve required (*see* **3**);

b) Class designation and nominal diameter of the valve;

c) Diaphragm material required;

d) Body material required;

e) End connections, that is, screwed or flanged;

f) Whether flanged end valves are required drilled or undrilled;

g) If screwed, state whether female taper threads are required and if other than in accordance with IS : 554, the type required. If other forms of end connection are required, give full details;

h) If actuator operation is required, details of the actuator and its power supply and the design maximum pressure differential across the valve; and

j) State if any of the following is required:

   1) Stem sealing,

   2) An indicator,

   3) Test certificate, and

   4) If inspection of the valves is required to be done by the purchaser or his representative.

EXPLANATORY NOTE

In the preparation of this standard, considerable assistance has been derived from BS : 5156-1974 'Screw down diaphragm valves for general purposes', issued by the British Standards Institution.

Printed at Simco Printing Press, Delhi, India